

Appl. No. 09/587,103
Amdt. dated September 15, 2003
Reply to Office Action of April 14, 2003

REMARKS

Claims 1 through 10 are pending in the present application. Claims 11 through 20 have been canceled.

Applicants thank Examiner Manoharan for the courtesy of a telephone interview on March 17, 2003 and for agreeing to having a telephone interview upon receipt of the enclosed amended claims if the Examiner has any further questions of patentability for the amended claims.

Claim 1(a) has been amended to reflect the feed stream composition of 99.9 wt.% isopropyl alcohol containing 200 to 500 ppm organic impurities and having a moisture content of 100 ppm or less. Claim 1(b) has been amended to further clarify that the feed stream is being separated into an overhead and a bottoms stream. Claim 1(b) has also been amended to further clarify the components of the overhead and bottoms streams.

The Examiner rejects claims 1 through 10 under 35 U.S.C. § 112, first and second paragraphs, as not enabling a person skilled in the art to make and use the invention and/or for failing to particularly point out and distinctly claim the subject matter Applicants regard as the invention.

It is respectfully submitted that the process steps of claim 1, as amended, enable a person skilled in the art to make and use the process and that the subject matter of the present invention is distinctly claimed. As now recited in claim 1(a), the feed stream consists essentially of at least 99.9 wt.% isopropyl alcohol containing 200 to 500 ppm organic impurities and having a moisture content of 100 ppm or less. As now recited in claim 1(b), the feed stream is separated into an overhead stream containing increased concentrations of components having a boiling point less than isopropyl alcohol and a bottoms stream containing increased concentrations of components having a boiling point greater than isopropyl alcohol, as defined in Applicants' specification.

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Any isopropyl alcohol in the overhead stream and the bottoms stream is not high purity isopropyl alcohol. Furthermore, claim 1(c) states that the high purity isopropyl alcohol is removed from the separation column at a point other than the overhead or bottoms streams. Therefore, it is clear that separation does occur and that all the streams differ in composition. Thus, reconsideration and withdrawal of this rejection is respectfully requested.

The Examiner rejects claims 1 through 10 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

(a) The Examiner states that claims 1 through 10 are incomplete for omitting the recitation of a distilling step and for not reciting the feed stream metals and water contents.

Claim 1(a) has been amended to recite the organic impurities and moisture content of the feed stream. It is respectfully submitted that claim 1 does recite a separation step as part of the claimed process and, as amended, further clarifies the components of the feed stream, overhead stream, sidestream, and bottoms stream. Furthermore, dependant claim 8 specifically claims distillation as a separating process. Applicant respectfully requests reconsideration and withdrawal of this rejection.

(b) The Examiner states that the claim language "separating said isopropyl alcohol into an overhead stream . . . and a bottoms stream wherein any isopropyl alcohol in said overhead stream and said bottom stream" in claim 1 is ambiguous. Furthermore, the Examiner states that the composition of the feed stream, overhead stream, sidestream, and bottoms stream are all the same compound.

Claim 1(b) has been amended to more clearly recite the compositions of the overhead and bottoms streams. It is respectfully submitted that, as amended, the feed stream, overhead stream,

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bottoms stream, and sidestream have differing compositions. Applicant respectfully requests reconsideration and withdrawal of this rejection.

(c) The Examiner states that claim 9 does not state the differing compositions of the overhead and bottoms streams.

Claim 9 recites the wt.% of both the overhead stream and bottoms stream. As clearly known by those skilled in the art, a mass balance can be performed on the streams entering and exiting the separation column. The mass of the feed stream entering the separator is equal to the mass of the overhead stream plus the mass of the bottoms stream plus the mass of the sidestream. Claim 9 clarifies this mass balance by stating that of the total weight of the feed stream, about 5 to 30 wt.% exits the separation column by the overhead stream and about 5 to 30 wt.% exits the separation column by the bottoms stream. The balance of the equation exits the separation column by the sidestream as high purity isopropyl alcohol, as defined in Applicants' specification. Claim 1, as amended, further clarifies that the compositions of the overhead stream and the bottoms stream differ. Applicant respectfully requests reconsideration and withdrawal of this rejection.

Claims 1 through 10 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 4,788,043 to Kagiya et al. (Kagiya) or U.S. Patent 5,585,527 to Marker with or without U.S. Patent 5,868,906 to Adams et al. (Adams).

Claim 1 recites a process for producing high purity isopropyl alcohol comprising the steps of (a) feeding a feed stream consisting essentially of at least 99.9 wt.% isopropyl alcohol containing 200 to 500 ppm organic impurities and having a moisture content of 100 ppm or less into a separation column; (b) separating the feed stream into an overhead stream, containing increased concentrations of components having a boiling point less than isopropyl alcohol, taken overhead from the separation column and a bottoms stream, containing increased concentrations of components having a boiling point greater than isopropyl alcohol, taken as bottoms from the

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separation column, wherein any isopropyl alcohol in the overhead stream and the bottoms stream is not high purity isopropyl alcohol, as defined in Applicants' specification; and (c) removing the high purity isopropyl alcohol at a point: (i) below where the feed stream enters the separation column but above the bottoms stream, or (ii) above where the feed stream enters the separation column but below the overhead stream. The high purity isopropyl alcohol has a metals content of less than about 1 ppb and a water content of less than about 100 ppm.

Kagiyama discloses a process for purifying a waste organic solvent, such as isopropyl alcohol, used in semiconductor manufacturing. The waste organic solvent to be purified is an organic solvent containing water, an acid, other electrolytes and particles. The water content is in the range of 10 to 40% by weight. The process to purify the waste organic solvent is a three-stage process that includes pervaporation and distillation.

Marker discloses a continuous distillation and membrane separation process. In one embodiment, the stream to be separated is a mixture of isopropyl alcohol and water, typically from an isopropyl alcohol production process where the water is present, for example, in an amount about 82 mass%. The process uses a single vessel having both distillation and membrane separation capabilities.

Adams discloses a method for the on-site reprocessing of waste isopropyl alcohol generated in semiconductor manufacturing to an ultradry and ultrapure level. The method includes the use of a pervaporation step followed by double distillation.

It is respectfully submitted that contrary to the Examiner's contention, a prima facie case of obviousness has not been established. To establish a prima facie case of obviousness, three requirements must be satisfied. First, the prior art relied upon, coupled with the knowledge generally available in the art at the time of the invention, must contain some suggestion or incentive that would have motivated the skilled artisan to modify a reference. *In re Fine*, 837 F.2d 1071, 1074, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988). Second, the proposed modification

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of the prior art must be viewed from the vantagepoint of the skilled artisan at the time the invention was made. *Amgen, Inc. v. Chugai Pharm. Co.*, 927 F.2d 1200, 1209, 18 U.S.P.Q.2d 1016, 1023 (Fed. Cir. 1991). Lastly, the prior art reference must teach or suggest all of the limitations of the claims. *In re Wilson*, 424 F.2d 1382, 1385, 165 U.S.P.Q. 494, 496 (C.C.P.A. 1970).

It is respectfully submitted that the cited references, taken either alone or in combination, fail to teach or suggest all of the limitations recited in claim 1. The process of the claimed invention requires a feed stream 100 having at least 99.9 wt.% isopropyl alcohol containing 200 to 500 ppm organic impurities and having a moisture content of 100 ppm or less. Furthermore, the process of the claimed invention requires an overhead stream 110, a bottoms stream 120, and a vapor sidestream 130. Moreover, the process of the claimed invention results in a vapor sidestream 130 with a high purity isopropyl alcohol containing less than 100 ppm water and less than 1 ppb metals content. The processes disclosed in the cited references, however, have feed stream concentrations less than 99.9 wt.% isopropyl alcohol, do not disclose or suggest vapor sidestream, and do not produce high purity isopropyl alcohol.

The feed stream 7 of Kagiya has between 0.5 to 3 wt.% water, therefore the concentration of isopropyl alcohol in feed stream 7 is between 97 and 99.5 wt.%. (col. 4, lns. 40-45). Kagiya has a refined organic solvent stream 18, exiting the overhead portion of the distillation column, and a waste organic solvent stream 20, exiting the bottoms portion of the distillation column. Kagiya does not disclose or suggest removal of isopropyl alcohol or high purity isopropyl alcohol at any point between the overhead stream 18 and the bottoms stream 20 in the separation column. The isopropyl alcohol in Kagiya is removed from the overhead stream 18. But even after purification by the inventive process of Kagiya, the purified isopropyl alcohol has a concentration of 99.7 wt.%, which is not as pure as the isopropyl alcohol feed stream nor as pure as the high purity isopropyl alcohol product exiting by the vapor sidestream of the claimed invention. Furthermore, the purified isopropyl alcohol distillate of Kagiya has 0.02 ppm of Na ions, 0.003 ppm of K ions, 0.003 ppm of Fe ions and 0.001 ppm

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of Cu ions. This is contrary to the high purity isopropyl alcohol produced by the claimed process of the present invention, which has a metals content of less than 1 ppb.

Like Kagiyaama, Marker fails to disclose or suggest a process by which the feed stream to be purified has at least about 99.9 wt.% isopropyl alcohol containing 200 to 500 ppm organic impurities and having a moisture content of 100 ppm or less, as recited in claim 1. The feed stream 30 of Marker has a concentration of 50 mass % isopropyl alcohol. In addition, Marker also fails to disclose or suggest a process in which the high purity isopropyl alcohol is removed by a vapor sidestream. Marker discloses a feed stream 30, an upper distillation zone overhead stream 50, an upper distillation zone bottoms stream 36, and a lower distillation zone bottoms stream 42. The upper distillation zone overhead stream 50 is a recycle stream that combines with the feed stream 30. Therefore, Marker only discloses an upper stream 36, a bottoms stream 42, a feed stream 30, and a recycle stream 50. Furthermore, the isopropyl alcohol exiting the column in the upper stream 36 has a concentration of less than 3% water, which is a concentration less than the feed stream of the present invention.

It is respectfully submitted that Adams fails to cure the deficiencies in both Kagiya and Marker, in that it also fails to disclose or suggest a process for producing high purity isopropyl alcohol by feeding a feed stream having at least about 99.9 wt.% isopropyl alcohol containing 200 to 500 ppm organic impurities and having a moisture content of 100 ppm or less into a separation column, and removing high purity isopropyl alcohol from a point in the separation column between the overhead stream and the bottoms stream to produce an isopropyl alcohol with less than 100 ppm water and less than 1 ppb metals content, as recited in claim 1. Adams discloses a process for producing ultradry and ultrapure isopropyl alcohol with a series of pervaporation and distillation steps, none of which remove high purity isopropyl alcohol from a point in the separation column below the overhead stream and above the bottoms stream, as recited in claim 1. The ultrapure and ultradry isopropyl alcohol produced by Adams is removed from the overhead streams 85 and 135.

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Therefore, the cited references, taken either alone or in combination, fail to disclose or suggest each and every limitation recited in claim 1. As such, claim 1, as well as claims 2 through 10 which depend either directly or indirectly from claim 1, are patentably distinguishable over the cited references.

In summary, Applicants submit that the pending claims are patentable over the cited references. It is respectfully submitted that the claims overcome the rejections set forth in the Office Action, and thus place the claims in condition for allowance. Reconsideration and withdrawal of all rejections of the claims are respectfully requested.

Respectfully submitted,

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Date

Louis N. Moreno
Louis N. Moreno
Registration No. 44,953

ExxonMobil Chemical Company
Law Technology
P.O. Box 2149
Baytown, Texas 77422-2149
(281) 834-5675 Voice
(281) 834-2495 Facsimile
lou.n.moreno@exxonmobil.com

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